

Intra-sexual competition in female European rabbits



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INTRODUCTION

The social system of the European rabbit *Oryctolagus cuniculus* is characterised by a linear rank order within both sexes, where a low social rank position has been reported to cause a reduced number of offspring and lower life expectancy resulting in negative fitness consequences. The existence of a rank order can be considered as the consequence of intra-sexual resource competition, where females, above all, compete for resources which are necessary for their reproductive success. Here, we investigated within-group resource competition in female European rabbits by looking at social interactions and spacing behaviour.

Questions:

1. Between which of the females does strong competition occur?
2. Which resources do the females compete for?

RESULTS & DISCUSSION

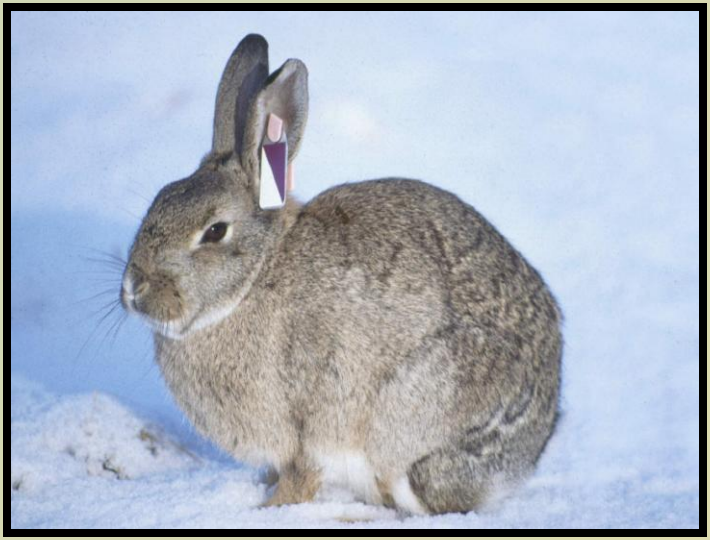
MATERIALS & METHODS

Study population

The study was conducted on a population of European rabbits living in the grassland habitat of a 20,000 sqm enclosure with minimal human interference. This year was a special situation because the density of the population was very low (18 female and 6 male rabbits). All 18 females of the population were studied. For identification the animals were marked individually using ear tags.

Data collection

All data were collected from April to July. The animals were trapped and weighed monthly. We conducted regular behavioural observations of the animals for about 4-6 hours per animal each month and monitored defensive, offensive and sociopositive behaviour by focus animal sampling. We also defined the home range size and the degree of overlap by localization of the females at intervals of two minutes. The observations were conducted within a four hour period at the dusk, because the social behaviour is highest at this time. The social rank of the female rabbits was determined by the frequency of offensive and defensive behaviour.



Seasonality of intra-sexual aggression

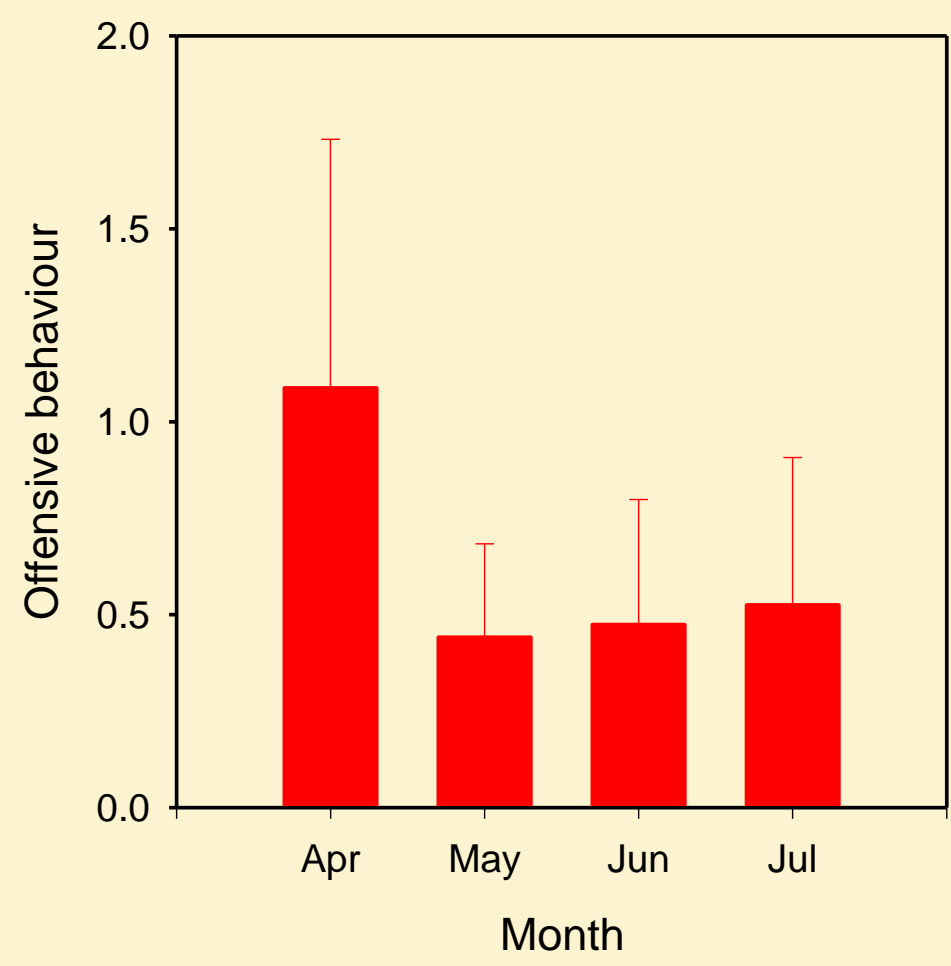


Figure 1. Monthly means of offensive behaviour (+ 95% confidence interval) in female rabbits during the breeding season. Offensive behaviour = interactions/h



Intra-sexual agonistic behaviour showed a strong seasonality with a distinct maximum peak at the beginning of the breeding season. This indicates intense resource competition at the beginning and a ritualisation throughout the course of the season.

Who's the aggressor ?

Model	R ²	RSS	ΔAIC
<i>c+d</i>	0.445	1.0942	2.76
<i>c</i>	0.438	1.1084	0.00
<i>d</i>	0.096	1.7847	3.53
(.)	0.478	1.9724	10.41

Model	R ²	RSS	ΔAIC
<i>c+d</i>	0.113	1.3827	6.47
<i>c</i>	0.065	1.4619	4.36
<i>d</i>	0.058	1.4614	1.71
(.)	0.135	1.5455	0.00

Table 1. Sets of candidate models for the frequency of aggressive interactions in dyads of females during the first (A, 01.04.-18.05.) and second (B, 19.05.-30.06.) six weeks of the breeding season. Factors considered are group density *d* and the age category combination of the females per dyad *c* (all possible combinations between one-year-old and older females). The lowest ΔAIC indicates the best model to explain the data.

Hypotheses:

- I. Females older than one year are in better condition at the onset of the breeding season and should have the highest "competitive power".
- II. Competition between females should be higher in high density groups.

- A) The first Hypothesis was met: The frequency of agonistic behaviour between the first time slot tested was best explained by the age category of the females involved in the dyadic interaction (see Table 1A). Agonistic conflicts between females that were more than one year old were highest (see Fig 2).
- B) None of the factors considered explained variations of the target variable better than the constant model (see Table 1B).

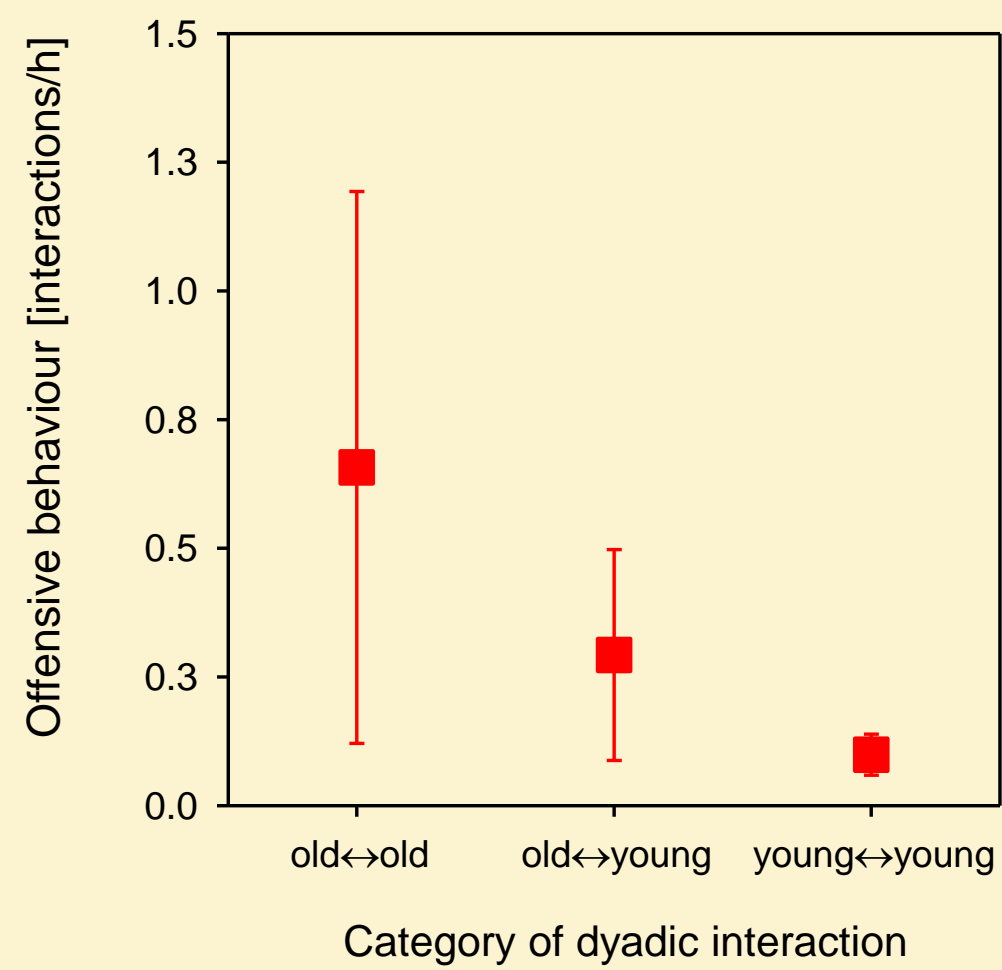


Figure 2. The frequency of aggressive interactions during the first six weeks of the breeding season in different categories of female-female dyads. old ↔ old: interactions between females older than one year old ↔ young: interactions between females older than one year and one-year-old females young ↔ young: interactions between one-year-old females This model was selected as the best model (see Table 1A).



→ Aggression during the first observation period was best explained by the age

Spacial interactions and space use of females

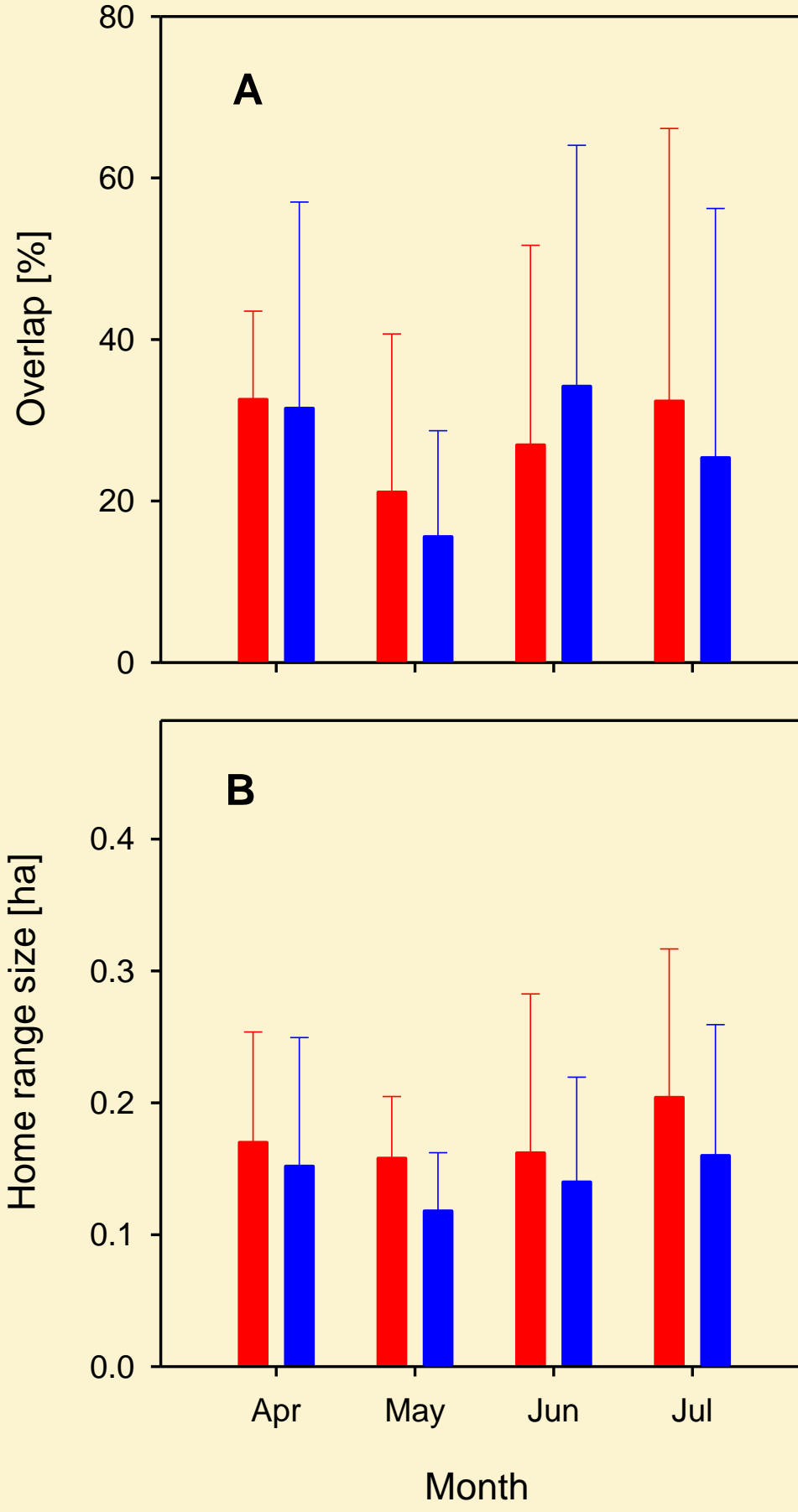


Figure 3A. Mean overlap (averaged per group, *n* = 5; + 95% confidence interval) of home range core areas (75% of the fixes) in low ranking (rank > 2) by high ranking females (red bars), and in high ranking (rank 1, 2) by low ranking females (blue bars).

Figure 3B. Mean home range size (averaged per group, *n* = 5; + 95% confidence interval, 75% of the fixes) in high ranking (rank 1, 2; red bars) and low ranking (> 2; blue bars) females.



The home range core area overlap as well as home range size did not differ between the two groups tested. Furthermore, a seasonality was not apparent in either of the parameters measured.

This indicates that high ranking females did not monopolise larger or more exclusive territories than subordinate members of the same group.

Competition for breeding sites

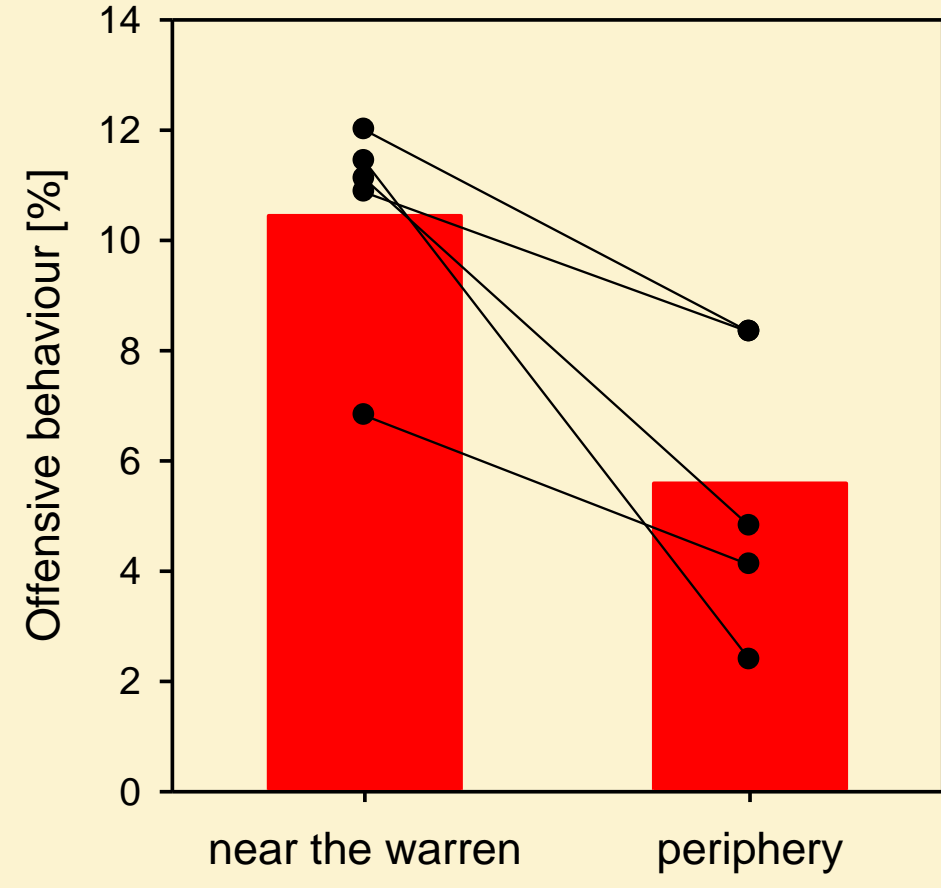


Figure 4. Percentage of fixes near to (< 10 m distance) or further away from the warren during which high ranking females (rank 1) were observed to initiate aggressive behaviour against female group members.

The probability that the high ranking female initiated agonistic interactions against female group members was more than twice (2.30 times) as high in close proximity to the warren than in the periphery.

This effect was apparent in all groups of our study population.

→ Females mainly compete for breeding sites

Competition for feeding sites

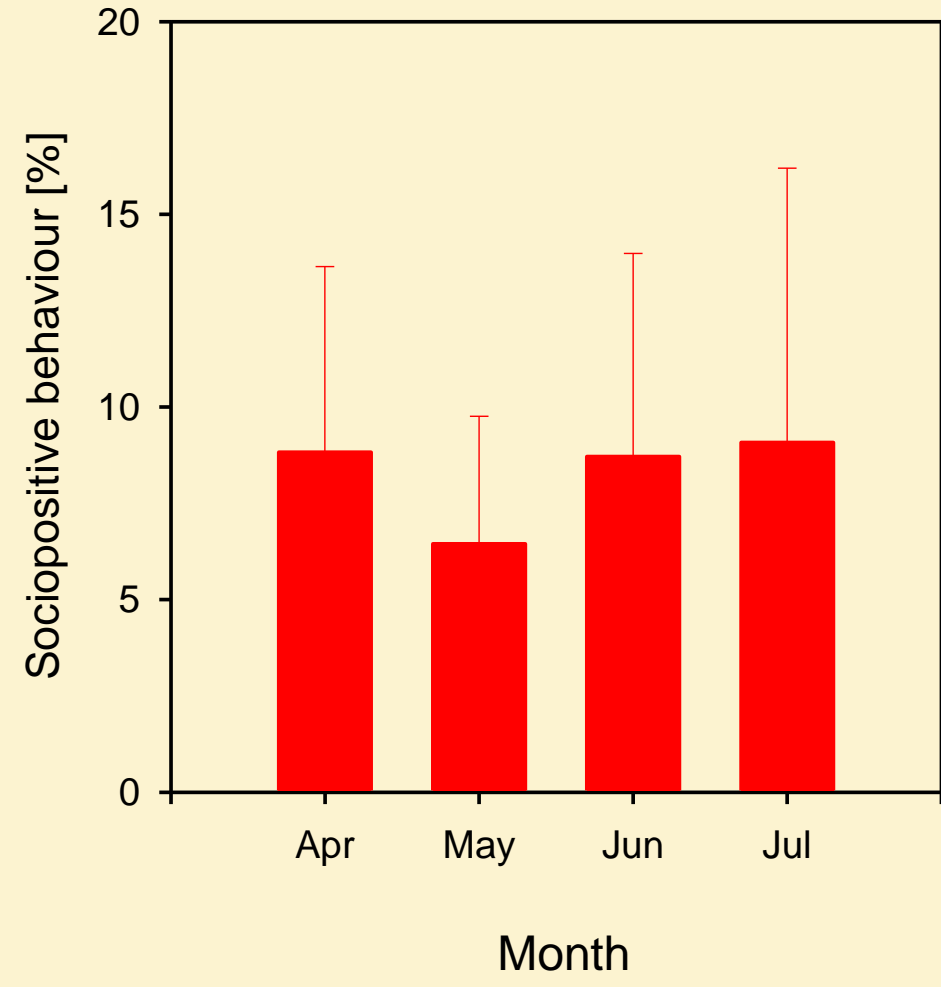


Figure 5. Monthly means of "sitting" in close proximity (+ 95% confidence interval) in female rabbits during the breeding season. This variable was measured as the percentage of time when the focal animal was observed feeding or resting within 2-metres of a female group member.

From April to July, the females were observed feeding or resting ("sitting") in close proximity to female group members during 8.27% of the observation time. The percentage did not decrease when agonistic behaviour decreased in May (see Fig. 1).

→ Competition for food may not play a major role

CONCLUSION

- The intra-sexual competition in female rabbits was highest between resident females which were more than one year old at the beginning of the breeding season
- Predominantly, females competed for access to breeding sites

